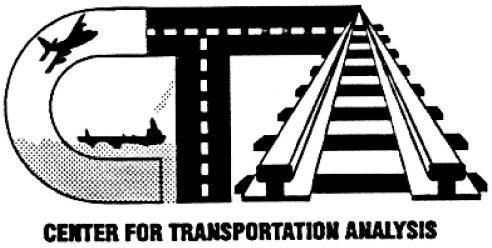
Oak Ridge National Laboratory
Center for Transportation Analysis

Energy Division
July 1997



INTERSECTIONS

Volume 4 No. 7

CFS Reveals a Truly Interstate Highway System

Shih-Miao Chin
Energy Policy Research Group, CTA

Truck freight in the United States consists overwhelmingly of ***inter***state shipments. This simple finding with profound implications for national transportation policy was clearly and convincingly demonstrated by ORNL researchers under the direction of Dr. S.M. Chin, using data from the Bureau of Transportation Statistics' (BTS) 1993 Commodity Flow Survey (CFS). The new data on commodity movements, the first nationwide data available in two decades and a major achievement of the newly-formed BTS, reveal that, when measured by ton-miles, nearly three-fourths of all truck movements cross state boundaries (see Figure 1). Measured by dollar value, 55% of shipments cross state lines (see Figure 2). At least for the 900 billion ton-miles and $4.3 trillion dollars of goods carried annually by truck freight transport, the principal function of highways is to connect states together into an integrated national economy.

Another interesting feature of the patterns uncovered by ORNL researchers is the wide variation across states in the volumes of through traffic. States occupying the geographical "corners" of the U.S., like Maine, Florida, Texas, and California, have proportionately larger shares of within state, and into and out of state shipments. For "interior" states like West Virginia, Kentucky, and Tennessee, or Utah, Nevada, New Mexico and Arizona, through state movements predominate. Because of the role

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CTA INTERSECTIONS
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David Greene, *Editor*
Debbie Bain, *Editorial Staff*

Tracking Cargo for the Military Traffic Management Command

Tykey Truett and Jane Rollow
Policy Analysis Systems Group, CTA

The Military Traffic Management Command (MTMC) books, ships, documents, and tracks surface cargo for the U.S. military for all military cargo movements. In late 1991, a team of CTA researchers completed a strategic study on information sharing within the MTMC. The research uncovered a clear need to develop a strategic transportation system and shared data environment to provide visibility of cargo worldwide.

Developing the new system, known as the Integrated Cargo Database (ICDB), presented several challenges to the Center for Transportation Analysis (CTA) staff. The system needed to be designed to ensure survivability. It had to be able to

(continued on page 4)

Director's Column: NEXTEA: ICED, HOT, OR TEPID?

Dr. Michael S. Bronzini, Director

Another watershed year is upon us in the reshaping of the post-Interstate federal transportation program in the United States. Unless you have been totally sequestered within the bowels of a library or laboratory during the past year, you realize that the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA, affectionately known as "ice tea") expires on September 30, 1997, which is but a few months from now. The ISTEA reauthorization process, which has been dubbed "NEXTEA", is well underway, with little consensus in sight. In fact, several distinctly opposing camps have emerged.

One group thinks that the increased flexibility and strengthened role of Metropolitan Planning Organizations in the project programming process, as well as other ISTEA provisions, are working just fine and deserve reauthorization with only minor changes. These folks favor an ISTEA-2 type of bill. A second group, made up of "donor states" who contribute more to the Highway Trust Fund than they receive back in federal aid appropriations, want a change in the funding formula that would raise significantly the minimum return from the Trust Fund, under the rationale that the national goal to link the states together with an expressway system has been met, so cross subsidies from one state to another should cease. A third group would go even farther and devolve the transportation program to the states, thereby getting Uncle Sugar out of the game entirely. Then there is the highway building lobby that doesn't like the flow of funds to non-highway modes and advocates HOTEA—A Highways Only Transportation Efficiency Act.

I personally believe that the federal role in providing an efficient and equitable national transportation system is far from over. As a traveler, consumer, and citizen, I want to have first rate highway, rail, water, air, and pipeline systems throughout the country, whether or not they happen to be in my own state or metropolitan area. I expect to use many of these systems and facilities, either directly as a traveler or indirectly as a consumer of products and services that rely heavily on the national transport system to move raw materials, intermediate goods, finished products, and information. Further, I want these systems to be maintained in first class condition, rehabilitated when necessary, and operated efficiently. While I recognize that the manner of collecting taxes or user fees at the federal level and parceling the funds back out to states and localities is not perfect, I don't want to leave it entirely up to the vagaries of local politics to decide what projects get funded. The federal-state-local partnership that has been in place for decades by and large works. Let's improve it, not throw it away.

What does this mean for those engaged in transportation research? Well, for one thing, the renewed debate on our basic transportation policy and systems presents an opportunity to do a better job of elucidating the federal role in providing a sound national transportation system, and communicating that role to the broad community of transportation stakeholders, public officials, and voters. This will require attention to developing the data, models, and analyses to do this effectively. We also need to pick up on the intelligent transportation systems and intermodal transportation initiatives started under ISTEA to enable us to do more with less in the transportation sector, and again tell the story of our accomplishments.

Oh, what about TEPID TEA? While no such "camp" yet exists in the policy debate, it might stand for "Transportation Efficiency through Planning and Intermodal Development." This could signify an intermediate position in the debate, characterized by a desire to see the consultative processes, intermodal activities, energy efficiency provisions, and related research under ISTEA continue, while opening the door to addressing some of the funding equity issues that have been raised.

Whatever your position on NEXTEA is, this would be an excellent time to communicate your position to your congressional representatives. And keep up with the debate; it should get pretty interesting.❖❖❖

CFS . . .(continued from page 1)

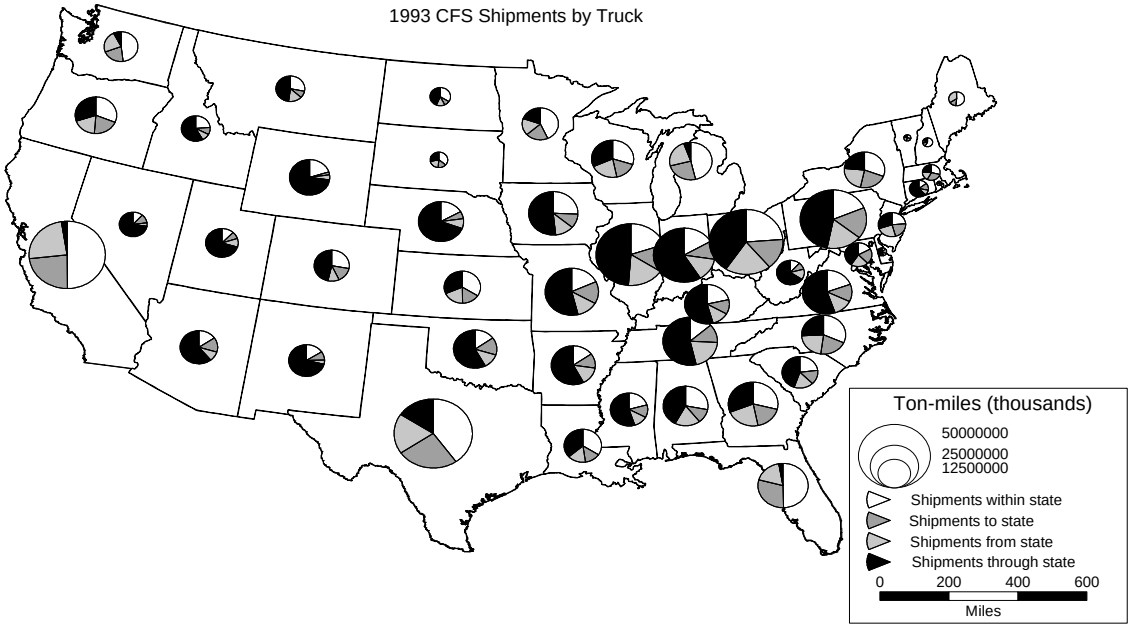

Figure 1

that freight trucks play in the wear and tear on highway pavements and structures, these patterns may have important implications for the allocation of highway revenues.

The 1993 CFS does not include all freight movements, however. To the CFS data, ORNL researchers added movements originating on farms based on statistics in the 1992 Census of Agriculture. Imports are also lacking in the CFS statistics. Preliminary analysis of data covering shipments across the Mexican and Canadian borders suggests that including these data will significantly change patterns for some of the Canadian borders states, such as Michigan and Maine. While the patterns for a few states may change significantly, the broad conclusions for the nation will be unaffected by the refinements currently being investigated. Further information on this analysis can be found on the BTS homepage, http://www.bts.gov, under "TranStats". ❖❖❖

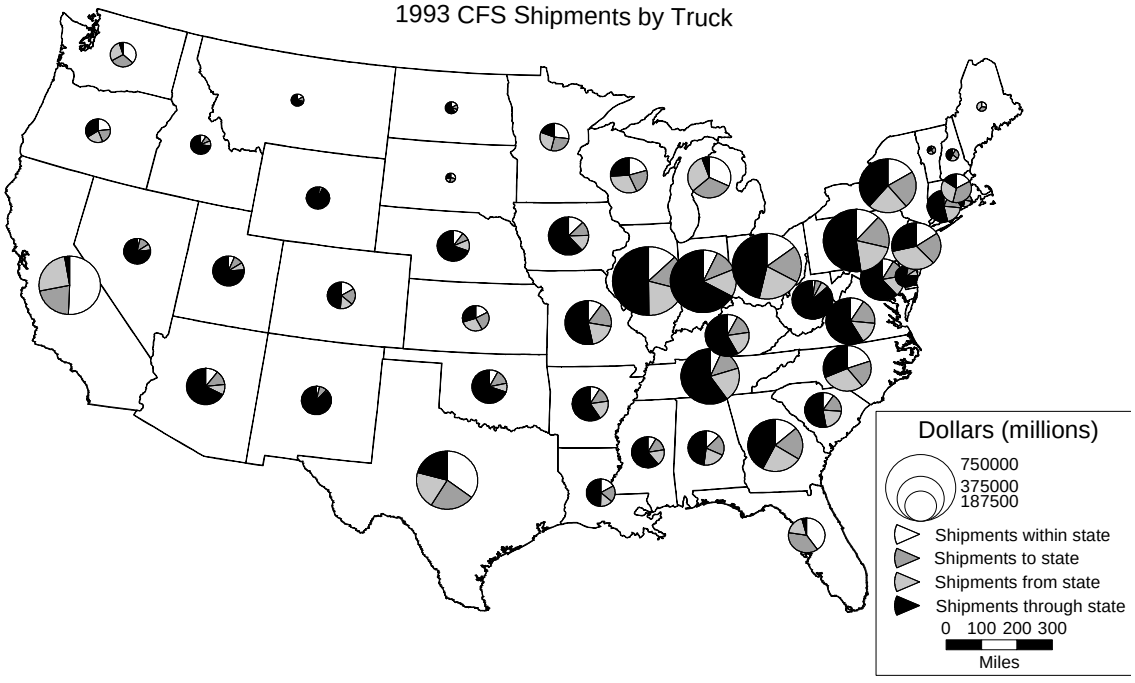

Figure 2

It had to be designed to be flexible and extensible enough to accommodate temporary port sites as well as the expansion of the system to include overseas capability.

After careful consideration of several architecture configurations, CTA staff recommended a distributed three-tiered architecture. The top tier consists of one large central database server located in Falls Church, Virginia. The middle tier consists of regional processing servers, called hubs. All of the port sites are components of the bottom tier of the architecture as shown in Figure 1.

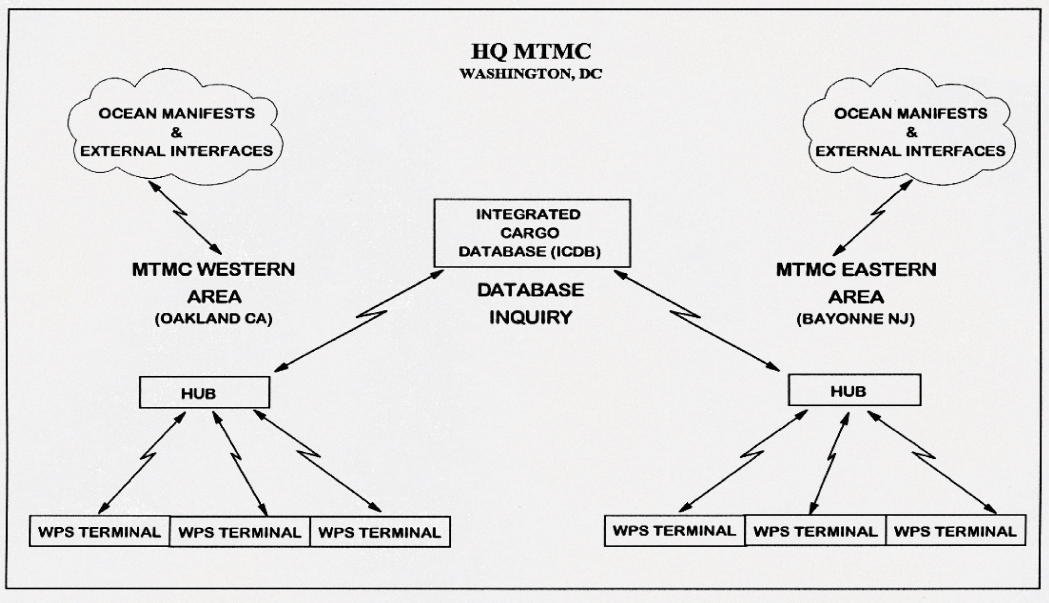

Fig.1. The architectural configuration for the ICDB.

The ICDB comprises a user interface, automated data processing modules, data extraction modules, and a system administration/database administration module. The user interface processes allow a user to build shipment records, to divert or resend manifests and other shipment documents, to perform shipment (single or aggregate summary) queries of the database, to produce reports, or to perform some functional tasks, such as edit invalid shipment records, monitor and/or change transmittal frequencies for automated reports, and redistribute code tables.

The user interface is designed so that users see only the menu options that correspond to their particular role (or need to know).

The second category of ICDB processes occur automatically (Figure 2). These processes include scripts (procedures) that are automatically activated every five minutes to pull data from each hub's associated port sites. There are also scripts to validate and convert data into the ICDB format as well as scripts that extract data and automatically transmit these data sets to other systems. An integral part of these processes is the automated scripts that perform integrity checks on the system hardware and software. If a hub fails an integrity check because the server can not make a connection, the system will automatically attempt the other two routes. If no connection can be made through any of these routes, the active hub will take over for the "unreachable" hub until a connection with it is made. This design ensures system survivability. Thus, the system repairs most problems without assistance. If human intervention is needed, the system sends out alarms to that effect.

The third category of ICDB processes are those that help to maintain the system. Some of these scripts are aids to be used by a system and/or database administrator. Others automate the process of adding or deleting a user, a site, or a hub to the system. This key feature allows the ability to quickly add port sites during contingency or emergency situations as well as the ability to expand hubs as ICDB becomes an overseas system (Figure 3).

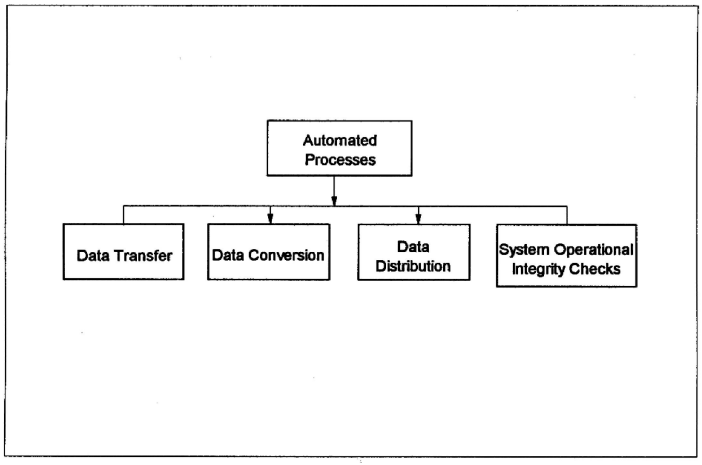

Fig. 2. The automated processes subsystem. All of these processes occur in the background; they do not appear on any menu.

CTA staff began helping MTMC develop ICDB in early 1992, working in conjunction with two MTMC subordinate commands (MTMC Eastern Area and Western Area), organizations at MTMC HQ, and several subcontractors. We are proud that the system we helped develop passed qualification tests in August 1995 and was successfully implemented in September 1995.
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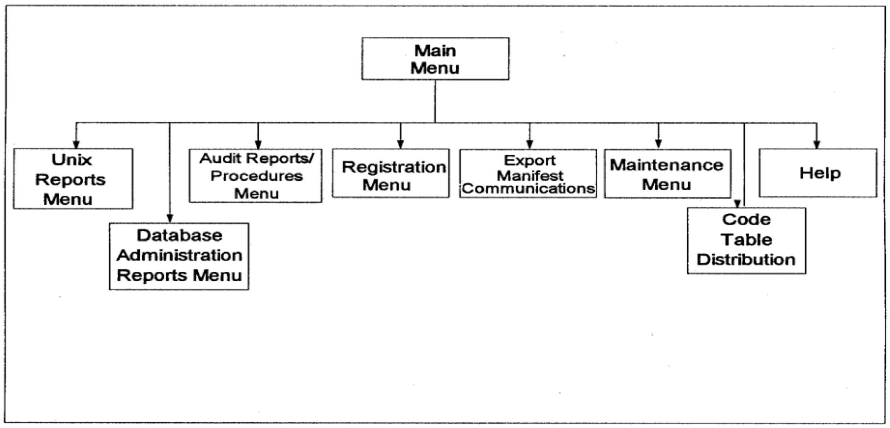


Fig. 3. The System Administration/Database Administration (SA/DBA) subsystem. This menu system is not available to functional users; it can be accessed only by SA/DBAs.

Network Buffering as a Tool in Corridor Analysis

Frank Southworth, Leader
Transportation Planning and Policy Group, CTA

The technique of network buffering, now available in commercial geographic information system (GIS) packages, can be used to compute the number of residents, business establishments, airports, etc., that are "covered," or located within a given distance of any transportation network and its transfer terminals. For example, this technique was used by the Federal Highway Administration to determine that over 90% of the US population is located within only five miles of the National Highway System. Figures 1 and 2 show how this procedure of buffering a network can be applied to a single high volume traffic corridor: in this case to a 10 mile buffer along either side of Interstate 75. As background, I-75 passes through 22 different Metropolitan Areas, with one-third of its almost 1800 centerline miles classified as urban. This includes passage through or around the cities of Saginaw, Flint, and Detroit, MI; Toledo, Findlay, Lima, Dayton, Middleton and Cincinnati, OH; Lexington, KY; Knoxville and Chattanooga, TN; Atlanta and Macon, GA; and Gainesville, Ocala, Tampa, Bradenton, Sarasota, Fort Myers, Fort Lauderdale, and Miami, FL. In 1992 the highway handled an estimated 71 million vehicle miles of travel daily, or almost 26 billion vehicle miles of travel for the year. Based on FHWA's Highway Performance Monitoring System data for 1992.

Figure 1 shows the entire I-75 corridor, while Figure 2 takes a closer look at the buffer in the vicinity of Detroit, Michigan. Each of the points shown in Figure 2 represents a Census (PL-94) Block Group. There are over half a million such data points covering the contiguous United States. Summing over all Block Group populations located within the buffer provides an estimate of the total number of residents with homes located within 10 miles of I-75. For the six States through which I-75 passes this comes to approximately 14 million people, or just over 30% percent of the population residing within those States.

Other interesting statistics that can be generated using the buffering technique with different spatially referenced datasets include the following:

Population, Employment, Income and Earnings along I-75 (Based on County Projections to 2040, U.S. Department of Commerce, Bureau of Economic Analysis, 1992)**:**

- Some 20 million people, including some 10 million workers, live within 20 miles of I-75. Over 14 million of these residents live within 10 miles of the highway.

- Between 1990 and the year 2020, county populations within this corridor are expected to grow by 23.4%, outstripping the nationally averaged growth rate by more than four percentage points. Total county employment growth in the

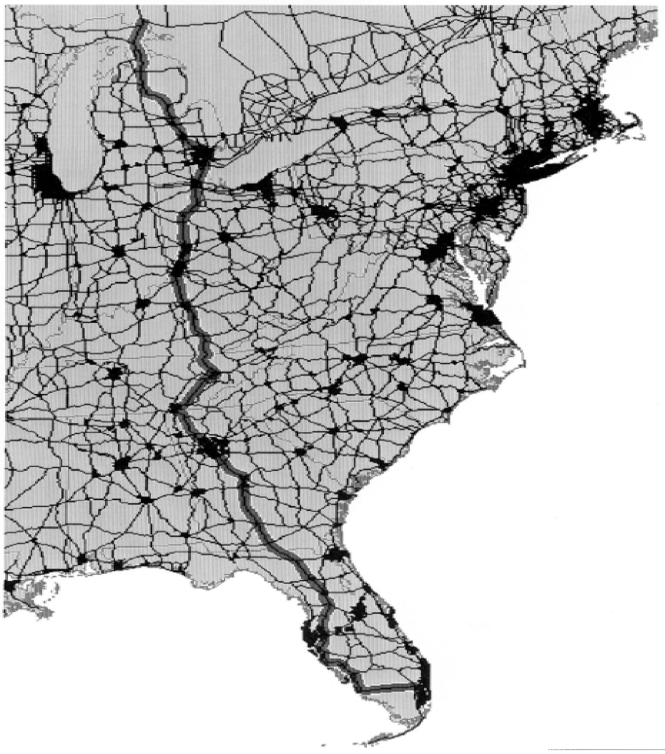


Fig. 1. Entire I-75 corridor.

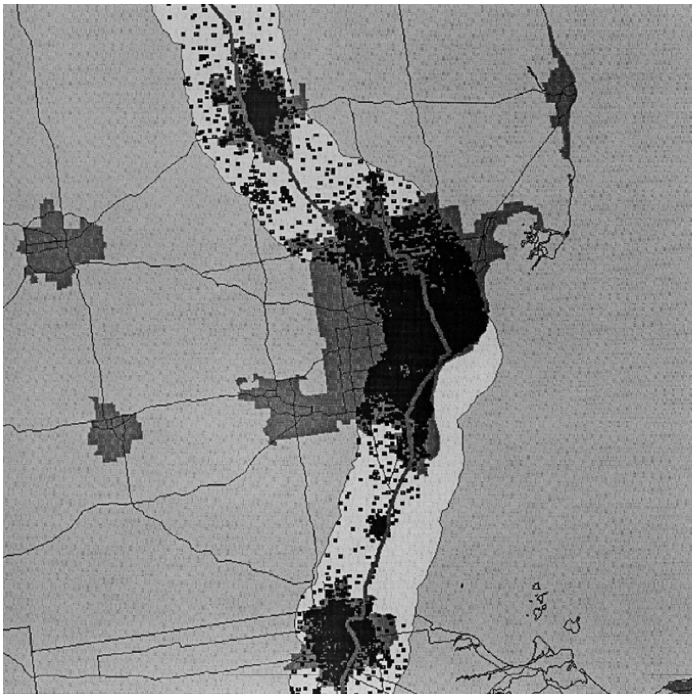


Fig. 2. I-75 buffer in Detroit, Michigan

corridor has also been forecast to outstrip the national average by more than two percentage points.

- Both personal income and earnings growth in counties through which I-75 passes directly are forecast to exceed the national averages by more than one and three percentage points respectively. A greater geographic concentration of earning power is also expected to occur along the corridor when looked at on a county-by-county basis. For example, while the total earnings power of the average US county is forecast to rise by 46.7% (in constant dollars) between 1988 and 2020, an average increase of 58.5% is expected within those counties containing I-75.

Intermodal Traffic Facilities:

- **Highway-Air**: In 1993, some 11% of the nation's annual aircraft enplanements, 14.5% of all air freight revenue tons, and more than 13.7% of the nation's mail revenue tons were handled at airports located within 10 miles of I-75. This included over 62 million passenger enplanements, including over 3 million enplanements on foreign air carriers. Most of this activity occurred at 10 of the nation's 100 busiest airports (Atlanta GA, Cincinnati and Dayton OH, Detroit MI, Fort Lauderdale, Fort Myers, Miami, Sarasota/Bradenton and Tampa FL, and Knoxville, TN) (Based on FAA data.).

- **Highway-Rail:** Numerous rail connections are found within 20 miles of the I-75, including 15 important trailer-on-flatcar and container-on-flatcar truck-rail interchange facilities, and 16 Amtrak passenger rail stations. (Based on FRA and FTA data.)

- **Highway-Water**: Significant waterborne commercial activity takes place at a number of inland ports and seaports along the I-75 corridor. Over 5% of the nation's coastal, inland, and Great Lakes tonnage is handled by ten ports located within 15 miles of I-75 (Detroit and Sault Ste Marie MI, Chattanooga and Knoxville TN, Cincinnati and Toledo OH, Charlotte, Miami, Port Everglades and Tampa FL). In 1993 this represented almost 120 million tons of cargo, one third in the form of imports and exports. (Based on Waterborne Commerce Statistics for 1993: US Army Corp of Engineers, 1994).

Nationally and Regionally Important Traffic Attractors:

- 17 National Parks Service sites are located within 40 miles of I-75. In 1993 these parks received over 47 million visits, including over 18.6 million recreational visits, representing 12.9% and 6.9% of the respective totals across all NPS sites. This includes the Great Smoky Mountains NP, the Everglades NP, the Big South Fork and the Chattahoochee River National Recreation Areas, the Chickamauga and Chattanooga National Military Park and Kennesaw Mountain National Battlefield Park, and the Martin Luther King Jr. and Cumberland Gap National Historic sites. (Based on National Park Service visitation data, 1993).

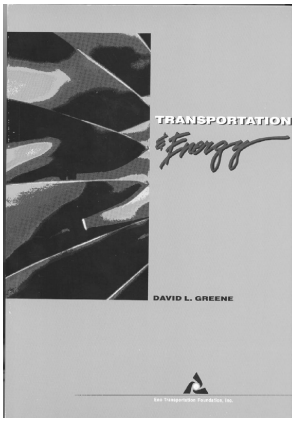
- In 1990 over 1.5 million vehicles crossed the border with Canada at Sault Ste Marie, and an additional 3.4 million vehicles crossed the border at Detroit. (Based on FHWA supplied data.)

Buffering is obviously a very useful tool for carrying out a market area analysis where demand for, or supply of, services occurs in close proximity to a transportation network. It is also useful for finding those populations who lack such proximity. A more demanding but potentially useful extension of the technique would be to develop buffers based on travel time or cost rather than purely geographic distance. This is easily done now around single point locations, by building travel time or cost contours around, for example, city centers. Adding equal travel access time or access cost buffers along entire transportation routes would make a useful addition to the growing number of automated procedures now offered by commercial GIS. ❖❖❖

CTA'S HOMEPAGE

The CTA Homepage, contains widely used transportation statistics/data that can be downloaded to your personal computer in either wordprocessing or spreadsheet format. This server also contains CTA project descriptions, staff biosketches, and newsletters. Research reports, databases, and computer models will be added to the server in the future. Visit our Homepage by going to:

http://www-cta.ornl.gov



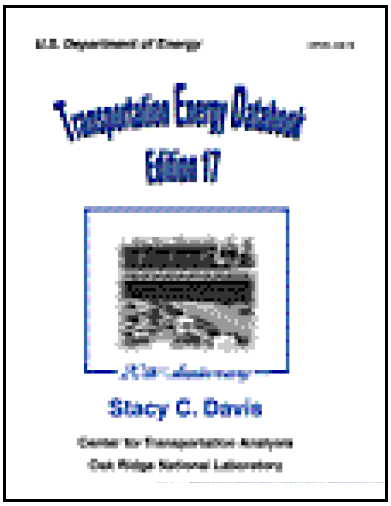
Transportation and Energy is available by contacting:

David L. Greene
Email--9dg@ornl.gov
Phone (423) 574-5963
Fax (423) 574-3851.

This book was written by David L. Greene, Energy Policy Research Group, ORNL Center for Transportation Analysis.

Transportation Energy Data Book

It's been 20 years! In January 1976, the Transportation Energy Conservation (TEC) Division of the Energy Research and Development Administration contracted with the Oak Ridge National Laboratory to prepare a Transportation Energy Conservation Data Book. The first edition of the TEC Data Book was published in October 1976. *The Transportation Energy Data Book: Edition 17* is expected to be available on the web in August 1997. (Edition 16 is now available). A celebration will be held on July 14th at the Oak Ridge National Laboratory to recognize this significant milestone. Dr. Phil Patterson of the DOE Office of Transportation Technologies will kick off this event. If you are interested in more information, please contact Stacy Davis, present *Transportation Energy Data Book* editor, at (423) 574-5957 (voice), or (423) 574-3851 (fax), or davissc@ornl.gov (e-mail).



The AMC Deployment Analysis System

Mike Hilliard, Leader
Operations Research Group, CTA

When the United States responds to a natural disaster, an international request for humanitarian relief or an act of military aggression by deploying military forces, the fastest means of moving people, equipment, and supplies is by air. In peacetime as well, the U.S. Air Force's Air Mobility Command (AMC) supports hundreds of movements around the world each day. More often than not, demand exceeds the resources required to move large amounts of cargo and personnel (aircraft, air crews, airfield parking, maintenance, and cargo handling equipment). As a result, making the most efficient use of assets (scheduling, routing, and assigning aircraft and crews) to meet the constantly changing demands is an extremely complex task that requires advanced computer support.

The AMC has been working with ORNL's Center for Transportation Analysis since 1986 developing a state-of-the-art scheduling system integrating all of its different peacetime and wartime planning functions. The state-of-the-art system, known as the AMC Deployment Analysis System (ADANS), has been operational since early in 1990 and since then has continued to expand in capability to support the breadth of operations managed by AMC. Today there are over 100 regular users of the system, and the user base is increasing rapidly as the air refueling community begins to sign on.

The last ten years have been a time of intense change for the U.S. military and in particular for the Air Mobility Command and its predecessor the Military Airlift Command. The ADANS project has responded to the changes, supported the changes, and in some ways encouraged the changes. Initially, MAC's concept for the ADANS system design was a large "super computer" with numerous terminals. The final system design included a heterogeneous collection of networked machines with powerful workstations on the user's desks. The original emphasis was on the development of large war plans, but from the beginning of the Gulf War until now the emphasis has shifted to quick response to unexpected events around the world. The original system design supported only airlift operations. The command reorganized to include air refueling operations and an entire new component has been added to the system. Initially the system was to have a limited number of users at three main locations. It now includes users at air refueling bases around the world.

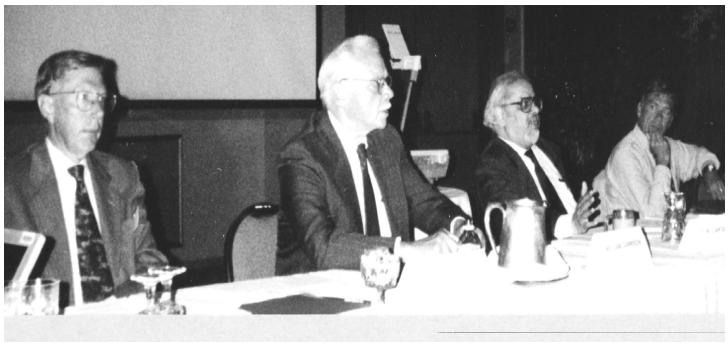
In January of 1997, the ADANS project moved into a new phase of development. ORNL turned over the official version of the Air Mobility Command (AMC) Deployment Analysis System (ADANS) to a private contractor for maintenance. The event was a culmination in many ways of a ten-year relationship with AMC, but it is not the end of ORNL's involvement with AMC. ORNL will continue to support the transition to the maintenance contractor, and we will continue to develop new software applications for the next release of ADANS (Version 17.0).

Though our team is now the smallest it has been since shortly after the beginning of the project, it is more sharply focussed on pathbreaking research. Today, we are developing some of the most interesting technical components we have ever designed. The goals for this summer's release include an ad-hoc query capability, and a graphical schedule editing capability that will allow the user to plan and replan a schedule by moving graphical representations of missions about on the screen.

The challenge of developing new scheduling tools, assisting the maintenance contractor in "coming up to speed", and trying to respond to users' needs as AMC moves to a corporate consensus on development strategies will involve the ORNL team for the next two years. The CTA is proud of its past research in support of our national defense, and we look forward to continuing to work with AMC to insure that our Nation has the most effective and efficient airlift possible. ❖❖❖

CTA Coordinated 1996 TSAR/NTS Symposium

by
Patricia Hu, Leader
Statistics and Data Analysis Group, CTA



Damian Kulash, President and CEO, Eno Transportation Foundation, Inc.; William Garrison, University of California, Berkeley; T.R. Lakshmanan, Director, Bureau or Transportation Statistics; and David Gillen, Wilfred Laurier University

In May 1996 the Bureau of Transportation Statistics (BTS) of the U.S. Department of Transportation (DOT) sponsored the *1996 Transportation Statistics Annual Report (TSAR) and National Transportation Statistics (NTS) Symposium*. Pat Hu of the Statistics and Data Analysis Group coordinated the symposium for the BTS. The primary goals of the symposium were to convene transportation experts around the country to evaluate two of BTS' flagship publications: *TSAR* and *NTS*; and, based on their evaluation, to advise BTS on the future directions of these publications. Participants included experts from the public sector, transportation industry, research community, and academia; representatives from each DOT mode administration, other Federal agencies, and special interest groups; BTS and ORNL staff; and other BTS contractors.

Symposium participants strongly agreed that a transportation annual report should go beyond merely reporting statistics. It should include assessments and perspectives, provide informed speculation of the course that the future may take, and identify data needs for better policy making. For a mature transportation system such as the United States', managing the system is as important as planning and building it. While information requirements change, the importance of information to the safety and efficiency of the system does not diminish. The *TSAR* plays a critical role in summing up the state of transportation, in all its complexity, and the state of transportation data for informing decision-making.

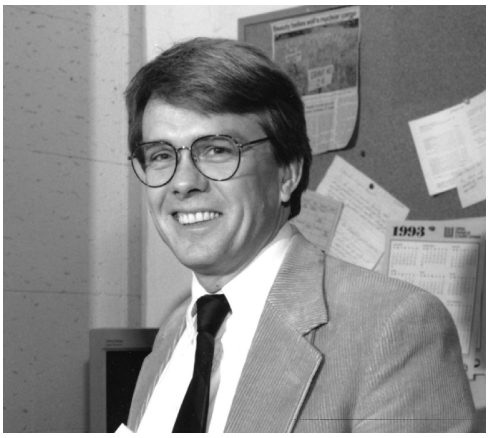
It was the symposium participants consensus that *TSAR* is generally on target and that BTS is doing a fine job of producing *TSAR* and *NTS*. With *TSAR* containing more information than most are aware, it is critical for BTS to ensure that these publications reach a large community.

To receive a copy of the latest *TSAR* and *NTS* reports, contact the BTS at (202) 366-DATA or order via the World Wide Web at:

http://www.bts.gov/btsprod/

Damian Kulash and T. R. Lakshmanan

Greene Appointed Editor-in-Chief of New DOT Journal



David L. Greene, Leader
Energy Policy Research Group, CTA

Dr. David L. Greene, a senior research staff member of the CTA, has been appointed by Dr. T.R. Lakshmanan, Director of the Bureau of Transportation Statistics to serve as first Editor-in-Chief of a new scholarly journal to be published by the U.S. Department of Transportation: *The Journal of Transportation and Statistics* (*JTS*). Approved by Secretary Peňa in 1996, the *JTS* will be the DOT's only scholarly journal.

Slated to debut in late 1997, the *JTS* will publish original research concerning the use of information to improve public and private decisionmaking for transportation. Examples of the types of contributions sought include

- methodological and empirical studies measuring transportation's activity and its consequences, analyzing transportation trends, or evaluating the performance of transportation systems,
- progress in the science of acquiring, validating, managing, and disseminating transportation information, including identifying and evaluating public information needs, and
- theoretical advances pertaining to transportation's role in society, the economy, and the environment, and the roles of private and public entities in the transportation sector.

Recognizing that transportation systems are increasingly interconnected on a global level, Dr. Greene has assembled an outstanding editorial advisory board of national and international scholars, including representatives from five of DOT's modal administrations.

Those interested in further information about the *JTS* are encouraged to visit its homepage on the Worldwide Web (www.bts.gov/programs/jts), or to contact Ms. Marsha Fenn, Managing Editor, *Journal of Transportation and Statistics*, Bureau of Transportation Statistics, U.S. Department of Transportation, 400 Seventh Street, S.W., Room 3430, Washington, DC, 20590. ❖❖❖

Solanki Takes Leave of Absence

by
Mike Hilliard, Leader
Operations Research Group, CTA

Because of his professional reputation in the fields of applied optimization, transportation system analysis, and decision support system development, Dr. Rajendra Solanki has been asked to assist private industry in developing advanced logistics support systems. Raj has taken a 1 year leave of absence to join i2 Technologies of Irving, Texas. Raj will be working with the consultants who understand customers' needs and the Development Engineers who create the commercial products. He will be researching and prototyping new techniques and applications which will eventually be developed into commercial products. His first project involves a large integer program problem dealing with production scheduling at a large chemical company.

Building on its expertise in military logistics, the Operations Research Group is looking to expand into the area of industrial and manufacturing logistics. Having one of its staff members work in this environment provides valuable experience for the group. Given the critical importance of transportation and logistics to economic competitiveness, this new area of research represents an exciting opportunity for Raj and for the Center for Transportation Analysis. ❖❖❖

Meet the CTA

Phyllis Daley

ITS Research Group, CTA

A panoply of postcards from around the U.S. and the world greets the visitor to Phyllis Daley's office. They could represent a decade of vicarious voyaging, but in fact they record the attempts of a roving research staff to stay connected to a friendly home base. Friends now gone and friends still here are all represented on Phyllis' wall in pictures from Hawaii, Indonesia, Monterey, Italy, and many, many more.

A native Anderson Countian in a Laboratory full of immigrants from all corners of the Nation and globe, Phyllis is a bond to the region in which we live and to its history. Her father worked in Oak Ridge in the earliest days of the Manhattan Project. She remembers how after being laid off and recalled for the third time, he decided to build homes instead of bombs and never returned to the Y-12 plant. Today, she continues to live in Anderson County with her husband Mike and her son Kris, who plans to attend the University of Tulsa next year on an academic scholarship. But especially dear to Phyllis' heart is her daughter Fancy who, stricken with rare Rett's syndrome in early childhood, must live in a special facility to receive the care she needs. The nearest suitable facility used to be in Chattanooga, but recently the Daleys have been able to move Fancy to a new facility in Oak Ridge so that they can be together more often. Indeed, Phyllis notes that one of her primary motivations for joining ORNL was our excellent medical and personal benefits, benefits that she hopes will be protected and extended.

Phyllis joined ORNL's Energy Division in 1987 as secretary of John Reed's Information Technologies and Human Systems Group. That group belonged to the Decision Systems and Research Center, which later merged with the transportation Research Section to eventually become the Center for Transportation Analysis.

Transferred to the Integrated Analysis and Assessment Section in 1990, Phyllis returned to the CTA in 1992 to work for Brian Jones' Deployment Analysis Group. Today, she is secretary of Steve Gordon's Intelligent Transportation Systems Research Group, helping them to stay on top of that dynamic field.

Phyllis' hobbies include cross-stitching, making ceramics, and caring for her two dogs: Sugar, a 6-year-old Samoyed, and Keesha, a 2-year old Keeshound. Keeshounds, she points out, were bred to ride on the river boats in Holland. Although she has made dozens upon dozens of ceramics (from music boxes to Christmas decorations) and cross-stitch creations, Phyllis has but one cross-stitch hanging in her home and displays very few ceramics. That's because she makes them to give them away. Weddings, births, church auctions, or just a friend who needs some cheering up, all are occasions that might inspire Phyllis to produce a hand-made gift. Those who know and work with Phyllis appreciate these and the many other contributions she makes. All of us are delighted to have this opportunity to say "thank you". ❖❖❖

Dr. Ho-Ling Hwang

Policy Analysis Systems Group, CTA

With four degrees in mathematics, statistics, and operations research, Dr. Hwang is one of the most versatile members of the CTA research staff. Currently Deputy Program Manager for CTA's Bureau of Transportation Statistics projects, Ho-Ling has also led numerous projects for the Department of Defense in the areas of expert systems applications, statistical computing and analysis, operations research, and database management system design. From 1990 to 1994 she served as an statistical consultant overseeing the development of a statistical quality assurance system for the monitoring of those handling uranium and other high-level radioactive materials. It seems that the equipment that measures and monitors exposure to radioactivity can at times drift out of calibration, leading to over or (worse) under-reporting of exposure. Ho-Ling developed graphical statistical computer software to catch emerging problems in data and to insure that all instruments were working properly, all of the time. "No mistakes!" is how Ho-Ling summarized the objective.

Now a U.S. citizen, Dr. Hwang first came to the United States in the late 1970s, having completed a BS in mathematics followed by two years of teaching in her native country of Taiwan (Republic of China). Greater opportunity and a chance to see new places and learn new things drew her towards the U.S. The eldest of a less than affluent family, she was expected to contribute to her family's finances, and opportunities in Taiwan were limited. So she accepted a scholarship and teaching fellowship at Illinois State University (ISU). Little information on American universities was available to her at the time, and so choices were based on cost, availability of financial aid, and the presence of friends or relatives in the immediate vicinity. What impressed Ho-Ling most about her stay at ISU was the friendliness of American and international students in the international students dormitory where she lived.

Ho-Ling's interests outside of work focus on her own family: her husband, CTA's own Dr. Shih-Miao Chin, and their son, Chuck. Chuck, who attributes his artistic talents to his mother and his prowess on the soccer field to his father, is also an excellent student and a decent chess player. At the recent junior national championships in Knoxville, he scored well against more than 400 young chess enthusiasts from around the U.S. Ho-Ling enjoys the times she can volunteer at school, helping with field trips or other activities, and getting to know Chuck's peers (who describe her as a "cool mom"). She is also active in the Pilot Club of Anderson County, having recently completed a term as board member of the organization. As most are aware, the Pilot Club performs a variety of community services, from running the Lifeline program at the Methodist Medical Center of Oak Ridge that insures older residents living alone of a connection to emergency services, to conducting special arts programs in Morgan County schools, and aiding the Emory Valley Center in Oak Ridge.

As Deputy Director of CTA's important programs for the BTS, Ho-Ling is responsible for overseeing the day-to-day operations of these crucial programs. But she also leads key BTS projects, like the estimation of travel distances and data quality assurance for the American Travel Survey. Building on experience gained from the 1993 Commodity Flow Survey, Dr. Hwang and her team of researchers developed novel and sophisticated methods that "saved" about 30% of the expensive travel survey data. A telephone/personal survey of detailed long-distance travel, the ATS was highly vulnerable to misspelled or misinterpreted place names, lapses of memory on the part of respondents, and a raft of other potential errors. Automated software developed by Ho-Ling and her team first diagnosed potential data problems and divided suspect records into those requiring manual versus automated checking. Experience with the CFS helped greatly here. Even the manual checking utilized advanced software that "learned" from previous errors and suggested solutions. Routines that calculated trip distances were designed to diagnose "odd" travel patterns and display suspicious itineraries using computer mapping, so that they could be examined by the "person in the loop". The unique combination of human and

artificial intelligence was able to decrease the number of invalid records in the survey from 30% to approximately 3%, making the difference between a barely acceptable result and an outstanding success. Throughout her career at ORNL, Dr. Hwang has time and again brought to bear the rare combination of technical expertise, innovation, and practical judgment that makes the difference between "good enough" and excellence. ❖❖❖

David P. Middendorf

Energy Policy Research Group, CTA

David Middendorf's interest in transportation began when he was about three years old. Back then, in the early 1950's, New York Central ran freight and passenger trains powered by steam locomotives through his hometown of Greensburg, Indiana. On Thursday evenings his family would stop at the depot and watch one or two trains roll by. He remembers watching his Dad board the James Whitcomb Riley passenger train for a business trips to Indianapolis or Chicago. Trucks also fascinated David. He remembers counting axles and estimating the length of the semi-trailers. Little did he dream that 25 years later he would be doing much the same things as part of a truck size and weight study.

Thanks to a scholarship offer, David enrolled in Purdue's School of Civil Engineering in 1967 and was soon attracted by the transportation side of the profession. He credits Dr. Kenneth Heathington, a member of his faculty advisory committee, with having the greatest influence on his career. Dr. Heathington introduced him to urban transportation planning and recommended courses in computer science, statistical analysis, operations research, and urban sociology to give him the tools necessary for work in that area. While at Purdue he spent a summer at the Chicago Area Transportation Study writing a FORTRAN program to graphically display the output of the Intervening Opportunities trip distribution model, and another summer at the Louisville-Jefferson County Air Board in Louisville, KY, assisting in the initial planning for a new regional airport.

After earning his Bachelor's Degree in 1971, David entered Purdue's Graduate School to study for a Master's Degree in civil engineering with a major in transportation. But when two key faculty members, Dr. William Grecco and Dr. Heathington, announced that they were leaving Purdue for The University of Tennessee David decided to join them and pursue a Ph.D. at U.T. During the three years David spent at U.T., the U.T. Transportation Center took shape and flourished under Dr. Heathington's leadership. By the time David graduated in May 1975, faculty and students from a wide variety of disciplines were coming to the Center to do research in innovative demand-responsive public transportation systems, ride-sharing, transportation brokerage services, vehicle diagnostic inspection systems, electric vehicles, and advanced rail-highway grade crossing devices.

Upon completing his work at U.T., David joined the Management Consulting Division of Peat, Marwick, Mitchell & Co. in Washington, DC. Most of his work there involved public transportation planning, particularly research into the transportation needs of elderly and handicapped persons, as well as traditional urban transportation planning such as a rail rapid transit study for Houston. But one study stands out. The Florida Department of Transportation asked PM to develop and implement forecasting models for both freight and passenger transportation demand into, within, and out of the State of Florida. No one had ever attempted to do anything like this before and given the lack of freight data there was considerable skepticism on all sides as to whether it could be done. David was given the task of developing the freight models. Working 15 hours a day seven days a week over a 17-month period, David became adept at scrounging whatever relevant data were available and squeezing every last ounce of utility out of it. That experience has turned out to be invaluable to David's more recent work at ORNL, helping to develop the National Commodity Flow Survey and developing a geographic database of intermodal

freight transportation facilities for the U.S. Bureau of Transportation Statistics.

In June of 1982, David returned to U.T. to be an Associate Director of the U.T. Transportation Center. Within a year Dr. Heathington left the Transportation Center to accept a promotion within the University administration, and was replaced by the CTA's own Dr. Michael Bronzini. David and Mike collaborated on several projects involving freight transportation including the MRS (Monitored Retrievable Storage) Study in which they analyzed the transportation requirements of a facility for temporarily storing and repackaging spent nuclear fuel rods. In 1986 David left U.T. to earn a master's degree in computer science at Purdue in 1988. David found the world of software development unsatisfying, however.

Deciding to return to transportation research, David joined the ORNL CTA in January 1993. Since then, most of David's assignments have involved freight transportation. His first project was an analysis of the effects of truck size and weight policies on the total logistics costs of truckload shippers. Previous studies of longer combination vehicles (truck tractors pulling multiple trailers) had examined such issues as safety, pavement damage, and motor carrier productivity. The ORNL study instead looked at the issue from the shipper's standpoint. It found that most truckload shippers would incur lower total annual logistics costs using longer combination vehicles. Mike Bronzini and David presented an award-winning paper on their findings at the 1994 Annual Meeting of the Transportation Research Forum.

David was also a member of the ORNL team involved in estimating shipment distances for the 1993 Commodity Flow Survey (CFS), the first attempt to gather nationwide data on the flow of goods and materials within the United States since the Commodity Transportation Survey (CTS) of 1977. David's role in the CFS effort included documenting the distance estimation methodology, developing a quality assurance plan, and reviewing the results of the distance calculations. This project received a Significant Event Award from ORNL. Since then David has been developing a geographic database of intermodal freight transfer facilities for the BTS's National Transportation Atlas Database (NTAD). In addition to the intermodal facilities database itself, the work will produce a first-ever report describing the characteristics and wide variety of intermodal facilities in the United States, the design of the database, the sources of data used to build it, and suggestions for maintaining it in the future.

Though David's time at ORNL has been a busy one, it has not kept him from pursuing his favorite hobby — railroad photography. (You can see a sample of his artistry below.) It gives him a chance to get outdoors, to be creative, and, most importantly, watch trains. David also enjoys listening to classical music and reading (favorite authors are Mark Twain and Arthur Conan Doyle).

Throughout his career David has tried to learn as much as he can from whatever he is doing. He says that means he knows a little bit about a lot of things, but not a whole lot about anything. We disagree.

David assured us of the veracity of the biographical information presented in this article with the following oath. "If I am lying, may I be struck by a hotshot double-stack train being lead by a pair of shiny Santa Fe war bonnet locomotives." We just hope nothing ever derails his career at ORNL. ❖❖❖

Items

Michael Bronzini has been appointed to the Editorial Board of *Transportation Research Part E*. He also has been appointed to the Transportation Research Board's (TRB) committees on Transportation of Hazardous Materials, the Task Force on National Data Needs and Requirements, the Committee for a Study of Policy Options to Address Intermodal Freight Transportation, and reappointed to the Committee on Freight Transportation Data. Mike also received a Lockheed Martin Significant Event Award for his many contributions as the Bureau of Transportation Statistics' (BTS) program manager.

Shih-Miao Chin won a Lockheed Martin Energy Systems Significant Event Award recognizing the team development of the National Commodity Flow Survey Distance Computations for the U.S. Department of Transportation (DOT) and the Census Bureau. The results of the National Commodity Flow Survey Distance Computations are a vital element in the DOT and Census Bureau publications and data products on the 1993 Commodity Flow Survey, and will be utilized by researchers worlwide for years to come.

Nicolas Dominguez co-organized the "First International Seminar on Electric Vehicles (EVs) in Mexico City" which took place in Mexico City on June 14, 1996. Sponsored by the Mexican Department of Energy, the Government of Mexico City and ORNL (ORTRAN and CTA) and attended by government, industry and academia, the seminar reviewed the status of EVs and their applicability in the Mexican context. He also chaired a session "Technologies for Environmental Monitoring: From Research to Field Studies" at the International Symposium of "Optical Science, Engineering and Instrumentation, held in Denver, Colorado, August 4-9, 1996.

Congratulations to **Rick Goeltz** who passed the 15-year service milestone in May 1996, and thanks to Rick for his continuing contributions to the CTA and ORNL.

David Greene, Stacy Davis, Don Jones and S.M. Chin were awarded Lockheed Martin Significant Event Awards recognizing their contributions to the 1996 Transportation Statistics Annual Report (TSAR). In January of 1997, Dr. T.R. Lakshmanan, Director of the Bureau of Transportation Statistics, appointed David first Editor-in-Chief of the U.S. DOT's only scholarly journal, *The Journal of Transportation and Statistics*. The journal will debut in late 1997. Dr. Greene testified before the Subcommittee on Surface Transportation, Committee on Transportation Infrastructure, U. S. House of Representatives in the House's first of many hearings on the reauthorization of ISTEA. He spoke on *The Outlook for Surface Transportation Growth*. David has been appointed a member of the TRB's Committees on Alternative Transportation Fuels and on Transportation Energy, and has recently joined the Editorial Advisory Board of *Transportation Research D: Environment.*

Congratulations also to **Kerry Hake** whose 10-years of service to the CTA and ORNL were acknowledged in April, 1996.

At the invitation of the U.S. Department of Transportation, **Patricia Hu** participated in a strategic planning study of the impact that postponed retirements, longer productive lives, and the growing segment of older operators will have on the Nation's transportation system to be held at the Transportation Research Institute of the University of Michigan. Ms. Hu served on the "Expert Panel on Aging Scenarios." Pat has also joined the Editorial Advisory Board for the *Accident Analysis & Prevention Journal*, sponsored by the International Association for Accident and Traffic Medicine, and she has been appointed to the National Research Council's (NRC's) Committees on (1) Statistical Methodology and Statistical Computer Software in Transportation Research, (2) Urban Transportation Data and Information Systems, (3) Statewide Transportation Data and Information Systems, (4) Traffic Records and Accident Analysis, and (5) Highway Traffic Monitoring. Pat also received an award of merit in technical reports for an Energy Division publication—*1990 Nationwide Personal Transportation Survey Databook*, Volume 2—in the 1995/96 Technical Publications and Art Competition of the East Tennessee Chapter of the Society for Technical Communication.

Surlena Joiner's many contributions to the CTA and ORNL were acknowledged by a 5-year service award in May 1996.

Shaw-Pin Miaou was appointed a member of the TRB's National Cooperative Highway Research Program Project Panel G17-14 on Improved Guidelines for Median Safety in 1996. Shaw-Pin organized and conducted the CORSIM Workshop at the Kaman Science Corporation (KSC) in Colorado Springs, Colorado, in December. **Rekha Pillai**, **Mike Summers**, and **Shaw-Pin** presented a briefing on

the proposed CORSIM design at the workshop. Their contributions received glowing praise from KSC.

Sheila Moore received the Energy Division award for *Sustained Contribution to Excellence* (April 1993 - August 1996) recognizing the continuous high quality of her contributions to the Divison. Sheila also passed the 5-year service milestone in August 1996.

Ajay Rathi, leader of ORNL's Intelligent Transportation Systems research program, co-chaired the workshop "Bridging the Gap to the Deployment of ATMS," held in St. Petersburg Beach, Florida, October 1-6. The international workshop focused on the issues involved in deployment of advanced traffic management systems over the next decade and on assessing user needs. Ajay has been appointed to the NRC's Committees on Artificial Intelligence and Traffic Flow Theory and Characteristics, and has also been appointed to the *Transportation Research* journal's Editorial Advisory Board.

Frank Southworth has been appointed to two boards of directors by the Association of American Geographers. They are (1) the Mathematical and Quantitative Methods Specialty Group, and (2) the Energy and Environment Specialty Group.

Elaine Thompson received a *Sustained Contribution to Excellence* award in recognition of the continuous high quality of her contributions to the Energy Division.

Bruce Tonn chaired the workshop "Information Technology, K-12 Education, and the Issue of Sustainability" in Chattanooga, Tennessee, September 25-26. The workshop explored the use of information technology in improving and catalyzing K-12 environmental education, with an emphasis on sustainability. Bruce was an invited participant at the *National Science Foundation Workshop on Culture, Society and Advanced Information Technology* in Washington, June 1-2, 1995; and at the *Symposium on Future-Oriented Government* in Honolulu, January 10-12, 1996. He was also a debate participant at the *Resolved: Information Technology Will Improve the Quality of Life Significantly for Americans in the 21st Century*, 1995 Conference on Computing for the Social Sciences in San Diego, June 19, 1995. ❖❖❖

Bring Your Child to Work Day

The CTA participates each year in the "Bring Your Child to Work Day." Pictured above are some of the past participants. They include Kerry Hake and his sons Carl and Phillip; Ho-Ling Hwang and S.M. Chin and their son Chuck; Debbie Bain and her daughter Jessica; and Pat Hu and her sons Ryan and Roddy.

1995, 1996, and 1997 Publications by Staff and Subcontractors

To obtain copies of any of the following publications contact Debbie Bain
Fax: (423) 574-3851
Email: d9b@ornl.gov

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